

HAWAII RANGE COMPLEX MONITORING PLAN  
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**INTRODUCTION**

This Monitoring Plan for the Hawaii Range Complex has been developed to provide required marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA).

In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a) (5) (a) of the MMPA states that National Marine Fisheries Service (NOAA/NMFS) must set forth “requirements pertaining to the monitoring and reporting of such taking”. The MMPA implementing regulations at 50 CFR Section 216.104 (a) (13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present (NOAA/NMFS, 2005).

While the Endangered Species Act does not have specific monitoring requirements, recent Biological Opinions issued by NOAA have included terms and conditions requiring the Navy to develop a monitoring program.

Navy Integrated Comprehensive Monitoring Program:

By the end of 2009, the Navy will have completed an Integrated Comprehensive Monitoring Program (ICMP). ICMP will provide the overarching structure and coordination that will, over time, compile data from both range specific monitoring plans as well as Navy funded research and development (R&D) studies. The primary objectives of the ICMP are to:

- To monitor Navy training events, particularly those involving mid-frequency sonar and underwater detonations, for compliance with the terms and conditions of ESA Section 7 consultations or MMPA authorizations;
- To collect data to support estimating the number of individuals exposed to sound levels above current regulatory thresholds;
- To assess the efficacy of the Navy’s current marine species mitigation;
- To add to the knowledgebase on potential behavioral and physiological effects to marine species from mid-frequency active sonar and underwater detonations; and,
- To assess the practicality and effectiveness of a number of mitigation tools and techniques.

More detail on the ICMP is provided in the Analysis and Reporting section of this document.

Hawaii Range Complex Monitoring Plan:

The Hawaii Range Complex Monitoring Plan (“HRC Plan”) is one component of the ICMP. The HRC Plan has been designed as a collection of focused “studies” to gather

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data that will allow us to address the following questions which are described fully in the following sections:

1. Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS' criteria for behavioral harassment, TTS, or PTS)? If so, at what levels are they exposed?
2. If marine mammals and sea turtles are exposed to MFAS in the HRC, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?
3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?
4. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?
5. Is the Navy's suite of mitigation measures for MFAS and explosives (e.g., PMAP, major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Marine Species within the HRC:

There are twenty-seven species of marine mammals that may be observed either seasonally or year-round in the Hawaiian Islands Range Complex; seven are endangered (Reviewed in DoN, 2005). The list of species range from the endangered humpback whale (*Megaptera novaeangliae*), whose Hawaii population appears to be increasing (Mobley et al., 2001), to the endangered monk seal (*Monachus schauinslandi*), to four species of threatened and endangered sea turtles, and other species of non-listed cetaceans such as bottlenose dolphins and spinner dolphins.

This monitoring plan has been designed to gather data on all species of marine mammals and sea turtles that are observed in the HRC. The Plan recognizes that deep diving and cryptic species of marine mammals such as beaked whales, sperm whales and minke whales, have low probability of detection (Barlow and Gisiner, 2006). Therefore, methods will be utilized to attempt to address this issue (e.g., passive acoustic monitoring and tagging).

Humpback whales and monk seals will also be given particular attention during monitoring in the HRC; although monitoring methods will be the same for all species. The Hawaiian Islands provide unique breeding and calving habitat for humpback whales, and as a result, the Hawaiian Islands Humpback Whale National Marine Sanctuary was developed. Some of the following studies will be conducted in areas where humpbacks appear to have seasonally high densities so that focal follows from them will be more available. While monk seals are expected to be observed at the same rate as small cetaceans, they will be given particular attention in the form of focal follows when observed. This is due to their unique endemic and endangered status and the fact that their population is in decline.

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Data will be collected by qualified, professional marine mammal and sea turtle biologists that are experts in their field. Researchers will provide annual reports to the Navy, however, this is expected to be an ongoing process with data collected, analyzed and interpreted over many years. It is not likely that firm conclusions can be drawn on most questions within a single year of monitoring effort due to the difficulty in achieving sufficient sample sizes for statistical analysis. The Navy will provide annual reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The report will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis.

### **MONITORING PLAN**

The monitoring methods proposed for use during training events in the HRC are:

- Contracted vessel and aerial surveys
- Tagging
- Passive acoustics
- Marine mammal observers on Navy ships

#### **Study 1**

Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS)? If so, at what levels are they exposed?

In order to address this question, there is a need to detect marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. Shipboard surveys, either from Navy vessels or contracted research vessels, will not enable the observers to see animals much below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial surveys, marine mammal observers aboard Navy vessels and tagging of marine mammals will be used.

#### **Methods**

A combination of aerial surveys, marine mammal observers, and satellite tagging will be used, in conjunction with regularly scheduled Naval training events. Aerial surveys are preferred for this type of monitoring as they provide the ability to observe animals that are below the surface (Slooten et al., 2004). This is particularly true in sea states of Beaufort 3 or less where water conditions are relatively calm therefore, the Navy will make every effort to conduct monitoring in sea states of Beaufort 3 or less.

Satellite tagging will allow for assessment of location, vertical and horizontal movements, and acoustic behavior (including sounds produced and received). Tagging is particularly important for cryptic and deep diving species such as beaked whales and

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minke whales. The study design allows for a sampling of data to come from areas that are known to have high densities of humpback whales (*Megaptera novaeangliae*).

Due to the number and spatial extent of vessels and aircraft involved, major exercises such as RIMPAC and USWEX are not the most appropriate option for the simultaneous use of commercial aircraft for marine mammal monitoring. However, the requirements to conduct this study are: 1) one or more surface combatants conducting ASW during a regularly scheduled training event; 2) the ability to conduct aerial surveys close to the Navy vessel; and 3) training events that occur close enough to shore that re-fueling does not become an issue with the aerial survey team. The Navy has identified three types of training events that will meet the requirements of the study and also provide the highest likelihood of success.

Based upon the Sonar Positional Reporting System (SPORTS) and knowledge of training events in the HRC, Navy operators determined that three types of training events are appropriate for Study 1 - Submarine Commander's Course Operations (SCC OPS), Tactical Readiness Evaluation (TRE) and unit level training. SCC OPS occur in February and August in the BARSTUR and BSURE ranges. TRE and Unit level training events occur regularly throughout the HRC and typically involve one or more ships. The proposed hours for conducting this study are shown in Table 1. The hours shown are actual study hours when active sonar is being used (e.g. aerial survey in conjunction with training event), with darkness and non-ASW hours removed. They represent the minimum number of hours available per year; more may become available. If more hours for Study 1 become available, then the Study may be completed in fewer years if robust sample size is obtained.

Data collection will begin after January 2009, after the LOA is issued and the monitoring plan is finalized (See Table 1 for year by year implementation schedule). Data will also be collected from the SOCAL and (East Coast) range complexes and compiled.

#### Aerial survey:

During unit level training, TRE and SCC OPS, an aerial survey team will fly pre-determined zigzag transects relative to a Navy surface combatant which is transmitting MFA sonar. The Navy will collect detailed ship track, speed and sonar use data for comparison with the survey data. The aerial survey team will collect both visual sightings (to be used to help calculate densities) and behavioral observations. These transects will allow for the gathering of movement relative to ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all aerial surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative data of densities and behaviors, which will complement the hours shown in Table 1.

A targeted 20% of data will be obtained from Penguin Banks and Pacific Missile Range (BSURE and BARSTUR) as they are areas with high densities of humpback whales. As much as feasible, the remainder of the study effort will be conducted in the lee of Maui and Hawaii Island as they will provide the highest probability of seeing animals in the

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water column due to overall calmer sea states. The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles including date; 4) time and visual conditions associated; 5) direction of travel relative to Navy vessel; and 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to estimate received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior.

Marine mammal observers on Navy vessels:

Marine mammal observers (MMOs) will be placed on Navy vessels involved in the study. Qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels. MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns.

MMOs will observe from the same height above water as the lookouts. Of note, these MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP) to allow for consolidation in the ICMP.

Tagging:

Tagging will be done in conjunction with 20% of the above aerial surveys to collect information on animals that are not observed by the aerial survey team or MMOs. Species will be tagged opportunistically; however the focus will be on cryptic and deep diving species such as beaked, sperm and minke whales that have the lowest rates of detectability (Barlow, 2003; 2006).

Tagging will be conducted during the seven days prior to the Navy training event, allowing animals the opportunity to distribute naturally prior to any potential immediate exposure to training activities. Tags shall be applied in a geographical area that is likely to be transited by Navy vessels during the training event. Satellite tags will be used as

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they allow for up to one month of data collection. The goal of the tagging effort is to examine spatial distribution of animals before, during and after training event.

All available data will be included in Navy’s annual report to NMFS. All subsequent analysis shall be completed in time for Navy’s five year report to NMFS.

## Study 2

If marine mammals and sea turtles are exposed to MFAS in the HRC, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?

Line-transect shipboard surveys are regularly conducted by NOAA/NMFS in the HRC to assess long-term trends in abundance (e.g., Barlow, 2003; Mobley, 2004). While funding dependent, it is assumed that data collection will continue. These NOAA surveys are partially funded by the Navy and serve to address this question on longer term trends in abundance. However, those surveys will not detect short term shifts in distribution, therefore, detection of redistribution on the order of days will be addressed by Study 2.

Marine mammal densities will be calculated from aerial survey data conducted immediately before and after training events. Additionally, autonomous recording devices will be used to gather additional data on movements of animals through the HRC, providing a baseline and data on animals not detected by the aerial survey.

## Methods

Aerial surveys:

Systematic line-transect aerial surveys will be conducted on the two days before and a variation of 1-5 days after a Navy training exercise to collect relative density data in the exercise area for marine mammals in the area. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to active sonar. One survey day after the training event will be devoted to flying the coastline of the islands closest to the training event to look for potential strandings. If a stranding is observed, an assessment of the animal’s disposition (alive, injured, dead, and decayed) will be immediately reported to CPF for appropriate action (e.g., notification of the NMFS Regional Stranding Coordinator).

Standard distance sampling methodology and techniques, as described in Buckland et al. (2001) and Kinsey et al. (2002), shall be used. Surveys will be conducted from a twin-engine aircraft, with two experienced NOAA trained or certified observers.

The survey will be flown at a speed of 100 knots and an altitude of 800 ft (244m). Two observers will spot marine mammals during the surveys and report data to a recorder. Information recorded will include species sighted, numbers of individuals, presence, or absence of a calf, behavior, angle to the sighting and any apparent reaction to the aircraft. It is important to note any unusual behavior or species associations. Additionally, GPS locations and altitude will be automatically recorded at 30-sec intervals, as well as

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manually whenever a sighting is made. Environmental data (sea-state, glare and visibility) will be manually recorded at the start of each transect leg and whenever conditions change. When appropriate, the aircraft may go off effort (off the trackline) for behavioral observations or for species identification. Digital photographs will be taken as conditions permit. In the event that a given flight date is canceled, due to weather conditions or mechanical problems, the survey will be flown on the next available good weather date.

Passive Acoustics:

No more than ten autonomous acoustic recording buoys (e.g. HARP, EAR or similar buoy; see Wiggins and Clark, 2007; Lammers et al., 2008) will be deployed in the HRC in order to detect, locate and track vocalizing marine mammals. Buoys will be set on a duty cycle to provide appropriate sampling coverage and maximize battery power and data storage space. Gliders with oceanographic sensors will be deployed in each of the monitoring areas to record oceanographic data concurrently with acoustic data collected by the autonomous acoustic recorders. The buoys will be distributed in an array to facilitate data collection on geographical movements, however, the exact placement of the buoys each year will be determined using operational guidance to maximize the likelihood of capturing data during training events. These buoys will be left in place for a long enough duration that data are collected both during and outside of training events.

Buoys will be retrieved as required (approximately six months) for maintenance and downloading of data. Autonomous acoustic recording buoys will provide long term, daily information on the presence and absence of marine mammals in each area and their movements through the area. This system will also provide information on the species present and their movements when an exercise occurs in that area (Mellinger and Barlow, 2003; Oswald et al., 2003). Acoustic data will be collected according to standard and accepted passive acoustic monitoring protocols (NMFS 2008 Passive Acoustic guidelines)

### Study 3

If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?

*Note: the methods used in Study 3 are the same as those used for Study 1, with the addition of vessel surveys. Vessel surveys are used here specifically for their ability to collect behavioral data and focal follows.*

In order to address this question, there is a need to assess whether marine mammals and sea turtles are not only at the surface, but in the water column. Observers aboard either Navy vessels or contracted research vessels will have difficulty observing animals below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the surface as do aerial surveys. Therefore, a combination of

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aerial surveys, marine mammal observers aboard Navy vessels and tagging of marine mammals will be used for this study.

### **Methods**

A combination of aerial surveys, vessel surveys, marine mammal observers, and tagging will be used in conjunction with training events. Aerial surveys are preferred for this type of monitoring as they provide the ability to observe animals that are below the surface. This is particularly true in sea states of Beaufort 3 or less.

Satellite tagging will allow for assessment of location, vertical and horizontal movements and acoustic behavior. The study design allows for a sampling of data to come from areas that are known to have high densities of humpback whales (*Megaptera novaeangliae*).

Due to the number and spatial extent of vessels and aircraft involved in major exercises such as RIMPAC and USWEX, they are not appropriate for the simultaneous use of commercial aircraft. Requirements to conduct this study are: 1) one or more MFA sonar equipped surface combatants conducting ASW during a regularly scheduled training event; 2) the ability to conduct aerial surveys close to the Navy vessel; and 3) training events that happen close enough to shore that re-fueling does not become an issue with the aerial survey team. In consultation with the CPF operational community, three types of training events were identified that would meet the requirements of the study and also provide the highest likelihood of success. They will also not likely interfere with normal training events.

The CPF operational community was asked to provide appropriate training events for the proposed study. Based upon SPORTS data and their knowledge of training events in the HRC, they determined that three types of training events are appropriate for Study 1 - Submarine Commander's Course Operations (SCC OPS), Tactical Readiness Evaluation (TRE) and unit level training. SCC OPS occur in February and August in the BARSTUR and BSURE ranges. TRE and Unit level training events occur regularly throughout the HRC and typically involve one or more ships. The proposed hours for conducting this study are shown in Table 1. The hours shown are actual study hours (e.g. aerial survey in conjunction with training event), with darkness and non-ASW hours removed. They represent the minimum number of hours available per year; more may become available. If more hours for Study 1 become available, then the Study may be completed in fewer years if robust sample size is obtained.

Data collection will begin after January 2009, after the LOA is issued and the monitoring plan is finalized (See Table 1 for year by year implementation schedule). Data will also be collected from the SOCAL and (East Coast) range complexes and compiled.

Aerial survey:

During regularly scheduled training events, an aerial survey team will fly pre-determined zigzag transects relative to a Navy warship which is transmitting sonar. The aerial survey team will collect both visual sightings (to be used for densities) and behavioral

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observations from observed animals. These transects will allow for gathering information regarding movement of a species relative to the ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative densities and behaviors.

A targeted 20% of data will be collected from Penguin Banks and Pacific Missile Range (BSURE and BARSTUR) as they are areas with high densities of humpback whales. The remainder of the studies will be conducted in the lee of Maui and Hawaii Island as they will provide the highest probability of seeing animals in the water column due to overall calmer sea states. The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles including date; 4) time and associated sighting conditions; 5) direction of travel relative to Navy vessel (s); and, 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to determine received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior.

Vessel surveys:

The primary purpose of the survey will be to document and monitor potential effects of the planned exercise on marine mammals and sea turtles. As such, parameters to be monitored for potential effects are changes in the occurrence, distribution, numbers, surface behavior, and/or disposition (injured or dead) of marine mammal and sea turtle species before, during and after the training event. While challenging, the vessel surveys will attempt to conduct focal follows on animals with Navy vessels in view. Particular attention will be given to obtaining focal follows on monk seals, humpback whales and beaked whales.

The vessel will conduct systematic line transect surveys in a survey box designated by the Navy (based upon training event distribution), to assess marine mammal distribution and abundance. Behavioral data will also be collected from all species. Specifically, the survey should deviate from transect protocol to collect behavioral data if a Navy vessel is visible on the horizon or closer. At this point, they will approach within three nautical miles of the vessel(s), if weather and conditions allow, and will work in “Focal Follow Mode” (e.g. collect behavioral data using the big eyes, and observe the behavior of any animals that are seen). The team will go off effort for photo-id and close approach “Focal Animal Follows” as feasible, and when marine animal encounters occur in proximity to the vessel. While in Focal Follow Mode, observers will gather detailed behavioral data from the animals, for as long as the animal allows. Analysis of behavioral observations will be made after the exercise or training activity (Altman, 1974; Martin and Bateson, 1993). While the Navy vessels are within view, attempts will be made to position the dedicated survey vessel in the best possible way to obtain focal follow data in the presence of the Navy exercise.

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Data will be logged using NOLDUS software, which is specifically designed to facilitate collection of behavioral data. This program will be specifically tailored to the needs of the HRC Plan and ICMP.

Marine mammal observers on Navy vessels:

Marine mammal observers (MMOs) will be placed on Navy vessels involved in the study. Qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels. As noted above, MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns. Marine mammal observers will observe from the same height above water as the Navy lookouts. Of note, these MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting effort will be conducted according to a standard operating procedure (SOP) to allow for consolidation in the ICMP.

Tagging:

Tagging will be done in conjunction with 20% of the above aerial surveys to collect information on animals that are not observed by the aerial survey team or marine mammal observers. Species will be tagging opportunistically, however the focus will be on cryptic and deep diving species such as beaked, sperm and minke whales that have the lowest rates of detectability (Barlow, 2003; 2006). Tagging will be conducted by qualified biologists with the required NMFS issued scientific research permit.

Tagging will be conducted during the seven days (week) prior to the Navy training event. Tags shall be applied in a geographical area that is likely to be transited by Navy vessels during the training event. Satellite tags will be used as they allow for up to one month of collection; in this case, allowing for data before, during and after training event.

All available data will be included in Navy's annual report to NMFS. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

#### **Study 4**

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What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives?

In order to address this question, there is a need to observe marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial and vessel surveys may be used.

A number of shallow water ranges are used for underwater detonation training (e.g., Puuloa Underwater Range, Ewa Training Minefield, Barbers Point Underwater Range, and Lima Landing). Current mitigation measures include monitoring the exclusion zone (size depends on the type and size of the explosives being used) beginning 30 minutes prior to detonation and for 30 minutes post detonation. Previous surveys have shown that marine mammals and sea turtles are sparse in those areas and are not resident or foraging areas for any species (Smith et al., 2006). The nearshore detonation events utilize relative small areas in comparison to MFA sonar training events that occur over large areas and regularly occur within specific areas of the range.

The sinking exercise (SINKEX) involves a vessel towed to a deep water offshore area (greater than 50 nm from shore) that is then sunk using a variety of munitions (5 in shell, bombs, missiles or torpedos). The duration of a SINKEX is unpredictable since it ends when the target sinks, sometimes immediately after the first weapon impact and sometimes only after multiple impacts by a variety of weapons. Typically, the exercise lasts for 4 to 8 hours over 1 to 2 days. SINKEX monitoring studies will occur during RIMPAC as part of that major exercise monitoring.

### **Methods**

Aerial or vessel surveys will be used 1-2 days prior to, during and 1-5 days post detonations. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to underwater detonation events.. The Navy may use divers to place explosive charges and those divers could provide information on marine species encountered.

Surveys will include the exclusion zone plus 2000 yards beyond the exclusion zone. For vessel based surveys a passive acoustic system (hydrophone or towed array) could be used to determine if marine mammals are in the area before and after a detonation event. If possible conduct focal surveys of animals outside of the exclusion zone (detonations would be delayed if marine mammals or sea turtles are observed within the exclusion zone) to record behavioral responses to the detonations. Monitoring will be conducted on three nearshore detonation events (i.e. mine neutralization, demolition of debris) per year and 1-2 offshore SINKEX events every other year as part of RIMPAC exercises. The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the detonation site; 3) the behavior of marine mammals and sea turtles including the standard environmental and oceanographic parameters described

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previously; 4) date, time and visual conditions associated with each observation; 5) direction of travel relative to the detonation site; and 6) duration of the observation. For safety considerations aerial surveys will only be conducted before and after detonation events. Due to the offshore nature of SINKEX, vessel based surveys are not an appropriate method for monitoring; therefore aerial surveys will be used. Shore-based monitoring, using binoculars or theodolite, will be used for nearshore detonation events where there are elevated coastal structures or topography.

Animal sightings and relative distance from the ship will be used post-survey to determine received energy and pressure (dB re 1 micro Pa-sec and pounds per square inch). This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels (energy and pressure based on distance to the source, bathymetry, oceanographic conditions and the type and size of detonation) and their corresponding behavior.

Brief aerial or vessel based surveys of the detonation area and near by beaches will be conducted for stranded animals over a two day period post detonation event (surveys would continue for five detonation events if no stranded animals are found). If a stranding is observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported immediately to CPF for appropriate action (notification to NMFS Regional Stranding Coordinator).

All available data will be provided to be included in Navy's annual report to NMFS. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

### **Study 5**

#### Is the Navy's suite of mitigation measures effective at avoiding injury and mortality of marine mammals and sea turtles?

It is the Navy's position that the suites of mitigation measures for sonar and explosives are effective at avoiding exposures of marine mammals to levels of energy or pressure from sonar or explosives that would result in harm or mortality of marine mammals. Through several methods, this study will provide the scientific data needed to support that position. The Navy will: 1) conduct aerial surveys before and after two major exercises per year (at least one of which includes multiple explosive detonations) to determine whether animals have been injured in the exercise area; and 2) conduct a comparison of professional marine mammal observers and Navy lookouts.

### **Methods**

Lookout comparison:

Navy lookouts are provided with extensive training to detect anything in the water 360 degrees around Navy vessels. This includes marine mammals. The Navy feels strongly that despite the fact that lookouts are not biologists trained to identify marine animals to species, that Navy lookouts have the skills to detect all marine mammals and sea turtles that are visible at the surface. In order to provide the scientific data to support this

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position, the Navy will initiate a side-by-side comparison of Navy lookouts ability to detect marine mammals at sea with sightings made by professional marine mammal observers. A minimum of 400 hours of data from a minimum of 20 Navy lookouts and 10 MMOs will be required to obtain a statistically valid sample size. It is assumed that the abilities of Navy lookouts and professional marine mammal observers will vary; therefore, it is important that data be collected from many locations, in many environmental conditions, with many different lookouts and MMOs.

Marine mammal observers (MMOs) will be placed on Navy vessels during regularly scheduled training events in the HRC. MMOs qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels. As noted above, MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns associated with such an endeavor. Navy lookouts will not be specially chosen.

Marine mammal observers will observe from the same height above water as the lookouts. Navy lookouts will officially be on duty and have the same responsibilities that they always do on duty (no more, no less). MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

To the extent practicable, the MMO and lookouts will avoid cueing each other when they observe a marine mammal. The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP) to allow for consolidation in the ICMP. Two marine mammal observers will be aboard, and work on rotating two hour shifts to avoid fatigue.

Comparisons of the following will be made between experienced observers and the lookouts 1) Rate of detection: Comparison of the number of animals sighted per hour (or other appropriate sighting period), 2) Distance of sighting: Comparison of the distance where the sighting was first made, 3) Distance estimation: Consistency of sighting distance estimates, 4) Animal size estimation: Comparison of animal size estimation (either by actual length or by grouping – small or dolphin size, medium and large), 5) Direction of travel relative to the ship or by compass bearing, 6) Behavior categorization: Comparison of the categorized of behaviors.

Aerial surveys:

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For two major exercises per year (at least one of which includes multiple explosive detonations), a contracted team will conduct pre and post aerial surveys of the exercise area. If the exercise was within 25 miles of the islands, the coastlines of those islands will also be flown to look for potential strandings. If a stranding is observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported immediately to CPF for appropriate action (notification to NMFS Regional Stranding Coordinator).

These aerial surveys will be the same as those conducted for other HRC monitoring studies. However, for this study in particular, survey data will include identification of any distressed, injured or stranded animals both in the training event area and adjacent island coastlines.

**IMPLEMENTATION**

For all field monitoring conducted in support of this plan, it will be the responsibility of the contracted researchers to obtain and maintain the appropriate permits.

Table 1 provides detail on how the HRC Plan will be implemented from fiscal year 2008 to fiscal year 2013. The implementation of this monitoring plan will not officially commence until January 2009, after the issuance of the Letter of Authorization. However, the Navy plans to continue methods used in 2007 and 2008 (pre and post aerial surveys, vessel surveys) as funding is available.

The monitoring plan will be implemented gradually in FY09, with full ramp up in 2010 as contracts are issued, permits for surveys and tagging are secured, Standard Operating Procedures (SOPs) are developed, and statisticians are consulted for input on sample size and analysis.

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**Table 1. Summary of studies planned each year.**

<b>STUDY 1,3, 4 (exposures and behavioral responses)</b>	<b>FY08</b>	<b>FY09</b>	<b>FY10</b>	<b>FY11</b>	<b>FY12</b>	<b>FY13</b>
Aerial surveys	Award monitoring contract, develop SOP, obtain permits	SCC OPS, or TRE or Unit Level - 60 hours of active sonar  Three nearshore underwater detonation events	SCC OPS or TRE or Unit Level - 60 hours of active sonar  Three nearshore underwater detonation events  1-2 SINKEX events	SCC OPS or TRE or Unit Level - 60 hours of active sonar  Three nearshore underwater detonation events	(Only if not enough data to complete study)  SCC OPS or TRE or Unit Level - 60 hours of active sonar  Three nearshore underwater detonation events  1-2 SINKEX events	(Only if not enough data to complete study)  SCC OPS or TRE or Unit Level - 60 hours of active sonar
Marine Mammal Observers	Opportunistic as staff and SOP developed	SCC OPS or TRE or Unit Level - 60 hours	SCC OPS or TRE or Unit Level - 60 hours	SCC OPS or TRE or Unit Level - 60 hours	(Only if not enough data to complete study)  SCC OPS or TRE or Unit Level - 60 hours	(Only if not enough data to complete study)  SCC OPS or TRE or Unit Level - 60 hours if study not completed
Tagging before during and after training events	NOAA project in conjunction with RIMPAC 08 (partial Navy funding)  Award monitoring contract	Order tags and secure tagging permit	SCC OPS August and February – 5 animals  Unit level - 5 animals	SCC OPS August and February – 5 animals  Unit level – 5 animals	SCC OPS August and February – 5 animals  Unit level – 5 animals	(Only if not enough data to complete study)  SCC OPS August and February – 5 animals  Unit level – 5 animals

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Vessel surveys (study 3 and 4 only)	NOAA project in conjunction with RIMPAC 08 (partial Navy funding) Award monitoring contract, develop SOP	USWEX – 40 hours Unit level – 100 hours Three nearshore underwater detonation events	USWEX – 40 hours Unit level – 100 hours Three nearshore underwater detonation events	USWEX – 40 hours Unit level – 100 hours Three nearshore underwater detonation events	(Only if not enough data to complete study) USWEX – 40 hours Unit level – 100 hours Three nearshore underwater detonation events	(Only if not enough data to complete study) USWEX – 40 hours Unit level – 100 hours Three nearshore underwater detonation events
Shore based surveys (study 4 only)		Nearshore underwater detonation events near appropriate coastal topography	Nearshore underwater detonation events near appropriate coastal topography	Nearshore underwater detonation events near appropriate coastal topography	(Only if not enough data to complete study) Nearshore underwater detonation events near appropriate coastal topography	(Only if not enough data to complete study) Nearshore underwater detonation events near appropriate coastal topography
<b>STUDY 2 (geographic redistribution)</b>	<b>FY08</b>	<b>FY09</b>	<b>FY10</b>	<b>FY11</b>	<b>FY12</b>	<b>FY13</b>
Aerial surveys before and after training events	USWEX – 60 hours RIMPAC – 40 hours	Unit level – 40 hours	Unit level – 40 hours	Unit level – 40 hours	(Only if not enough data to complete study) Unit Level - 40 hours	(Only if not enough data to complete study) Unit Level - 40 hours
Passive Acoustics	Award monitoring contract	Order devices and determine best location	Installation of 10 autonomous devices in the HRC Begin recording	Continue recording from 10 devices Begin data analysis	Continue recording from 10 devices and data analysis	Data Analysis and continue recording from 10 devices only if not enough data to complete study
<b>Study 5 (mitigation effectiveness)</b>	<b>FY08</b>	<b>FY09</b>	<b>FY10</b>	<b>FY11</b>	<b>FY12</b>	<b>FY13</b>
Marine mammal observers/lookout	Training Events –	Unit level –	Unit level –	Unit level –	(Only if not enough data)	(Only if not enough data)

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comparison	40 hours	100 hours Training events – 40 hours	100 hours Training Events– 40 hours	100 hours Training Events – 40 hours	to complete study) Unit level – 100 hours Training Events – 40 hours	to complete study) Unit level – 100 hours Training Events – 40 hours
Aerial surveys before and after training events, exercise area and coastlines	USWEX – 60 hours RIMPAC – 40 hours	Unit level – 40 hours	Unit level – 40 hours	Unit level – 40 hours	(Only if not enough data to complete study) Unit level – 40 hours	(Only if not enough data to complete study) Unit level – 40 hours

**ANALYSIS and REPORTING**

The ICMP discussed in the Introduction will provide the overarching structure and coordination that will, over time, compile data from both range-specific monitoring plans (e.g. HRC plan) as well as Navy funded research and development (R&D) studies. The analysis protocols that will be used for the ICMP are still in development phase at this time. However, data collection methods will be standardized to allow for comparison from ranges in different geographic locations. The sampling scheme for the program will be developed so that the results are scientifically defensible (e.g. statistically significant). For example, since all data for the ICMP will be collected using a behavioral program like NOLDUS, data collection will be standardized between the different geographical regions. A data management system will be developed to assure standardized, quality data are collected towards meeting of the goals. The data management plan shall provide standard marine species sighting forms for Navy lookouts and biologists to use to standardize data collection. Data for the HRC plan will be collected and analyzed by each contracted researcher, under an overall Indefinite Delivery/Indefinite Quantity (IDIQ) monitoring contract for the CPF area of operations. Some field methods may be applied in most ranges; however, some may be conducted only in one or two ranges that are most likely to produce the best quality data. For example, in Hawaii, there are some baseline data on odontocetes from tagging (Baird et al., 2006), which can be used to provide context for tagging data collected during training events. Additionally, the bathymetry of the Hawaiian Islands provides reasonable opportunities for data collection on both coastal and deep-water species.

The Chief of Naval Operations/N45, Naval Sea Systems Command, the Fleets and Office of Naval Research, provide approximately \$18 million per year for marine mammal research. Funding is provided to government, academic, and private contractors to help determine trends in abundance, for bio-acoustic research, and for studies specifically designed to gather more scientific data on the effects of sonar on marine mammals and sea turtles. This research builds the collective knowledge base on the geographic and temporal extent of key habitats and provides baseline information to account for natural perturbations such as El Niño or La Niña events. Additionally, this work contributes to the establishment of baseline information to determine the spatial and temporal extent of

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reactions to Navy operations, or indirect effects from changes in prey availability and distribution. These research studies, along with the data collected in the range specific monitoring plans will form the basis of the ICMP.

The ICMP will coordinate the programs progress towards meeting its goals, manage data sets, oversee field efforts, and develop a data management plan. A program review board to provide additional guidance may be established. The ICMP will be evaluated yearly to provide a matrix for progress and goals for the following year. The ICMP reports, and the range specific reports (e.g. HRC) will be used by Navy and NMFS of refinement and analysis of the monitoring methods, which can be used in annual LOA applications.

Due to the complexity of the ICMP and large number of U.S. Navy Range Complexes and training events, the Navy is considering the dedication of a Program Manager to oversee the ICMP. Specific qualifications, roles and responsibilities are yet to be determined but may include the oversight, coordination and management of all monitoring plans, including the Hawaii Range Complex monitoring plan.

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